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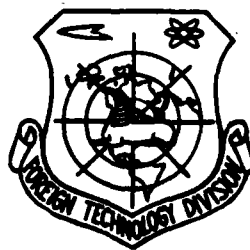
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(Selected Articles)



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GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

Recombination laser by laser-produced xenon plasmas

Li Lanping, Lu Zaitong, Zhang Dounan, Wang Zemin

(Shanghai Institute of Optics and Fine Mechanics, Academia Sinica)

Abstract. This paper reports a recombination laser of xenon plasmas produced by CO₂ laser excitation of gas mixtures of xenon and helium.

In this paper, we report on a recombination laser of Xe plasma produced in a gaseous mixture of He and Xe with a CO₂ laser pulse of wave length 10.6 micron. The particle number turns around to be the result of electron-ion recombination. The wave length of the Xe plasma recombination laser obtained in the experiment is 2.03 micron with an output power of more than 80 watts and a pulse width of 2.μsec. The experimental set up is as shown in Figure 1. The input CO₂ laser energy is supplied by a CO₂ laser with cold cathode electron beam controlled discharge. Each pulse has an energy of over 30 joules (pulse width 1-2μsec). After being reflected by a cylindrical reflector of focal length 6 cm in the target chamber, the CO₂ laser beam is focussed on a metal target of length 8 cm and width of 3 mm. At the two ends of the chamber are Brewster angle windows at 2.03 micron made by quartz plates. A 1 meter laser resonance cavity is formed by two concave reflectors with radius of curvature 6 meters. The matching hole of the output cavity plate is φ4. After passing through a Si filter plated with SiO₂, (transmission wave length range 1.2 - 8 micron), the laser beam is received by a micro calorimeter and the recombination laser output energy value is then read off from the digital voltmeter. The laser wave form is received by a InSb infra-red detector with a germanium lens (response wave length 2-7 micron) and displayed on a 200 mega hertz SS-6200 oscilloscope. The total response time of the detector system is less than 1 μsec. The photograph in Figure 2 is the Xe plasma laser wave form, laser pulse width being 2 μsec. The photographs in Figure 3 are

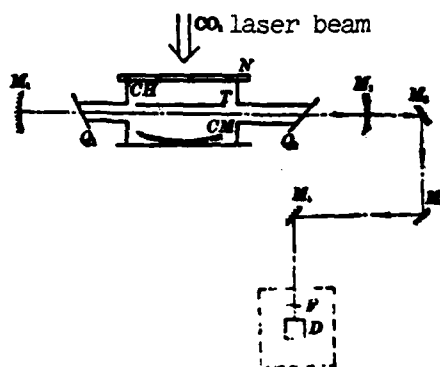


Figure 1. Experimental set-up. CH-target chamber; CM Cylindrical surface reflector; Q₁, Q₂-quartz plates; M₁~M₅ concave reflector; M₂ has a $\varnothing 4$ hole; F-Si filter; D- detector.

the pictures of the Xe plasma and the metallic target. From the picture of the plasma, it can be observed that the CO₂ laser beam penetrates the metal target after being focussed on it by the cylindrical reflector, and forms a rapidly expanding cylindrical plasma from the focal region on. The cylindrical formation has a length of 8-9 cm and diameter 5-7 mm.

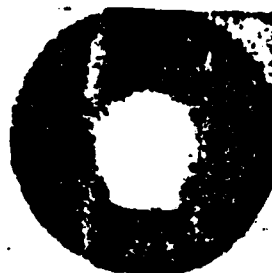
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The target chamber is filled with He-Xe gas mixture. The total gas pressure in the chamber has a sizable effect on the intensity of the Xe plasma recombination laser. In our experiment, we kept all the other conditions unchanged and varied only the total chamber pressure. The result is that when the total pressure is 700 torr the laser output energy is higher than that when the total pressure is 600 torr.

The output laser energy is related to the Xe:He ratio. After many trials, we found that at total pressure 700 torr, Xe:He=1:1000, the laser output is the strongest. The average output energy is 36 microjoules.



Figure 2. Laser wave form of the Xe plasma recombination laser (horizontal axis: 2 micron/division)



(a) 轴向观察



(b) 横向观察

Figure 3. Xe plasma and target (a) axial observation (b) lateral observation. (Photographed under visible light).

Since the ionization potential of Xe is lower than that of He, the density of Xe is also much lower than of He. Hence the Xe is almost completely ionized. Under this circumstance, the laser vibrational spectrum produced is that of Xe and not He or any other molecules. In Xe, the transition corresponding to $5d[\frac{3}{2}]_1^0 - 6p[\frac{3}{2}]_1$, has a wave length of 2.03 microns, that corresponding to $7p[\frac{5}{2}]_0 - 7s[\frac{3}{2}]_1^0$ has a wave length of 3.43 microns, that corresponding to $5d[\frac{3}{2}]_1^0 - 6p[\frac{1}{2}]_0$ has a wavelength of 2.65 microns and that corresponding to $7p[\frac{1}{2}]_1 - 7s[\frac{3}{2}]_2^0$ has a transition wave length 3.65 microns.

For Xe plasma recombination laser pumped by a CO_2 laser beam, the 2.03 micron line is the strongest, more than 10 times stronger than the other three lines. For Xe laser excited by electric discharge, the 3.5 micron line is the strongest [1].

Metallic target is used in the target chamber to lower the penetration threshold. The target material and shape directly affects the formation of plasma. We have experi-

mented with three different target materials, as shown in table 1. Among these the lead target is the best with the highest laser output.

Table 1. Laser output and different target materials.

Target material	average value laser output (Microjoule)	Maximum value of laser output (micro- joule)
aluminum	33	49
tin	36	52
lead	192	235

From the experiment, we know that there is a time delay between the onset of plasma lasing and the appearance of laser oscillation. The optical axis of the laser has a special spatial position for maximum laser output. It is the cooler external region of the plasma expansion, hence a laser is a radiation source with after-glow dominance. Thus, the mechanism of recombination laser radiation is the result of electron - ion recombination. After penetration, high electron density is produced. In the recombination process of Xe ions and free electrons, the electrons in higher energy states of neutral Xe atoms transit to lower energy states and form particle numbers between some special states .

Reference [1] W. T. Silfvast et al.; *Appl. Phys. Lett.*, 1977, 31, No. 8.

COLLECTION OF ABSTRACTS PRESENTED
AT 81 CONFERENCE OF SHANGHAI LASER
SOCIETY

Public lecture of Shanghai Laser Society run every two years was held from September 22-24. Papers presented covered new results and progress in the field of laser science and technology.

APPLIED OPTICS
STREHL CRITERIA AND FOURIER TRANSFORMATION LENS

Xu Fuhou (Shanghai Optical Instrument Research Institute)

This paper discusses the relationship between Seidel aberration and Sc in Fourier transformation lens based on Strehl's Criteria. Some useful results were obtained.

ON LASER SPECKLE INTERFERENCE METHOD TO SEPARATE NORMAL AND INWARD DISPLACEMENTS OF AN OBJECT SURFACE.

Liu Huiying (Shanghai Laser Technology Research Institute)

The measurement of surface inward displacement by the laser Speckle method will affect the fringe results if there is object normal displacement. In this paper, it is proposed to separate the two displacements by using the two Speckle interferograms obtained at two different object distances.

THEORETICAL ANALYSIS OF OPTICAL GRATING RESONANCE CAVITY

Wang Yumin (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

Starting with the Kirchhoff-Fresnel diffraction integral equation, it is proved that the "grating resonance cavity" is equivalent to the ordinary resonance cavity with inclined reflectors. The selectivity characteristics for oscillatory spectral wavelength of plane parallel optical grating cavity and spherical optical grating cavity are also calculated.

MOIRE PATTERN METHOD

Huang Weishi (Department Applied Physics Jiaotong University, Shanghai)

A line grating and its grating shadow projected on a reflecting surface will form a Moire fringe pattern which contains height (position) information on the surface profile to be measured.

In this paper the mathematical representation of the Moire pattern for an arbitrary position and the condition for its being isohypse are derived. Experimental data, together with photographs of static Moire patterns as well as Moire patterns during high speed transformation processes, are also provided.

ANALYSIS OF THE ACCOMPANIED ACOUSTIC-OPTICAL DIFFRACTION PHENOMENA IN FUSED QUARTZ ACOUSTICAL - OPTICAL Q SWITCH

Wu Yongfang (Shanghai Technological University)

In this paper we summarised the design principles obtained in years of research and development of laser interference systems: principles of the elimination of the restriction by extra degrees of freedom; of minimum boundary surface, of thickness and wedge, of laser beam collimation, of the fact that the laser beam should follow Gaussian propagation, of oblique incidence method to eliminate returned light and of equipment arrangement. Through investigating these principles, we have found ways to provide further improvement of the precision of laser ranging interference systems, and have supplied ranging interference systems for some high precision apparatus.

LASER PHYSICS

PHOTON AND HUATON MODEL OF FUNDAMENTAL PARTICLES

Song Mingzhao (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

Photon and all fundamental particles are formed by several higher level material particles with an integral charge --called huaton; the transformations between fundamental particles are the simple changes

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in the compositional relationship of these huatons; quarks do not ¹⁹⁴ exit. They are the description of the spatial distribution of huatons.

THE COLLISION PROBLEMS OF ATOMIC SPEED CHANGES IN POLARIZED INTERNAL-REGULATED EXCITATION SPECTRUM

Shen Waitian Wang Zhaoyong (Fudan University)

In this paper , we systematically introduced the fundamental principles of polarized, internal-regulating excitation spectrum by using, respectively, the velocity equation and semi-classical model methods and analysed the mechanism that has eliminated the Doppler effect due to collisions of atoms with velocity changes.

ANALYTIC SOLUTION OF THE INTERACTION EQUATIONS OF LIGHT AND A TWO STATE ATOMIC SYSTEM

Wang Yuenwen (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

In this paper, we obtained the simple analytic expression for the transition probability under various conditions. This has provided a more convenient mathematical form for investigating transition processes analytically.

(OPSE)OPTICAL PUMPING COHERENT RADIATION WITH OPPOSITE PARITY IN RUBIDIUM VAPOR

Lin Yuanqi, Qin Lijuan, Wang Zugeng (Department of Physics, East China Normal University)

Recently we obtained 4d-5P coherent radiation between the electric dipole forbidden transition 5S-4d energy levels in the metal Rubidium (Rb).

OCCURENCE OF SECOND HARMONIC WAVES IN HIGH POWER Nd:YAG LASER

Wu Huifa , Xu Huide (Shanghai Silicate Salt Research Institute, Academia Sinica)

A second harmonic wave of 0.53 micron and 2.5 Watt continuous

wave power is obtained with a BSN non-linear element in a 1.06 micron Nd:YAG laser cavity.

STABILITY STUDY OF TUNABLE SPECTRUM FOLDED-COMPOSITE CAVITY

Zhao Youyuan Gao Rufang Qian Hongsheng, He Maoqi (Department of Physics, Laboratory of Laser Physics, Fudan University)

We have described before how to use a folded-composite cavity to obtain 80 Watt of harmonic output. In this paper we emphasize the discussion on how to obtain long time spectral stability and power stability in this cavity. We also described and explained the phenomenon of auto-control of spectral stability in this cavity.

HELIUM CADMIUM LASER NOISE CHARACTERISTICS

Zeng Yongchao, et al (Shanghai Laser Technology Institute)

We have observed in this paper the relationship between Helium Cadmium laser noise and blue wave, pressure difference, as well as running glow fringe, explained the cause for the noise and obtained a high power low noise He Cd Laser with power higher than 100 milliwatt.

STUDY ON HIGH VALENCE (CRS) COHERENT RAMAN SCATTERING SPECTRUM TECHNIQUE

Wang Fugui, Yu Kuen, Liu Min, Chen Yisheng, Zhou Fuxin Liu Songhao (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

In this paper we introduced in detail the technique of a coherent Raman Scattering spectrum, its experimental set up, and the experimental conditions to obtain high valence coherent Raman Scattering. The experimental results are also analyzed and discussed.

EXPERIMENTAL STUDY OF WEAK SIGNAL STIMULATED BRILLOUIN SCATTERING

Xu Jie, Chen Yuming, He Guozhen (Shanghai Institute of Optics and Fine Machinery, Academia Sinica).

In this paper, the experimental study of weak signal stimulated Brillouin scattering is reported. When a strong wave and a weak wave

are incident simultaneously in a chamber with a CS_2 medium, the wave front reversal of the weak signal is observed.

PRODUCTION OF HIGH POWER PICO SECOND INFRARED PULSE BY EXCITED ELECTRON RAMAN SCATTERING IN CESIUM VAPOR

He Kexiang, Hui Linkai, Cui Gunwen, Li Quen, Liu Songhao (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

A 30 pico second 527 nanometer pulse is produced in Cesium vapor-excited electron Raman Scattering and we obtained an output of 1 millijoule 2.38 micron. Experimental parameters are also given.

STUDY OF THE COMPETITION EFFECT OF BACKWARD WAVE PARAMETRIC OSCILLATION AND EXCITED RAMAN SCATTERING

Fan Junyin, Wu Cun, Wang Zhiying (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We reported on the experimental and theoretical studies on the competition between coalescent 4-wave frequency mixing backward wave parametric oscillations and excited Raman Scattering.

HIGH POLYMER CARBON DIOXIDE LASER SPLITTING SPECTRUM STUDIES

Shu Jinzhi (Shanghai Organic Chemistry Institute, Academia Sinica)

A CO_2 laser splitting spectrum is used for fast-analysis of Trifluorochloro-ethylene-Vinylfluoride co-polymer (F_{23}) single component. In the splitting spectrum, the ratio of peak height, peak area of Trifluorochloroethylene to vinyl fluoride and the two single components in the polymer form a linear relationship. Experimental results indicate that the data obtained with lasers and the standard element analysis method (measuring the content of chlorine) agree.

PICO SECOND COHERENT ANTI-STOKES RAMAN SCATTERING

Liu Songhao, et al (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

In this paper we studied primarily the experimental technique of producing coherent anti-stokes Raman scattering with pico-second tunable laser in benzene.

LASER APPARATUS

AN INJECTION LOCKING DYE LASER WITH PULSED XENON ION AS PUMPING AND INJECTED LIGHT SOURCE

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Yang Yuenlong, Sun Shihu, Weng Yumin, Li Fuming, Zhang Zhiming (Physics Department, Fudan University)

An injection locking dye laser is described. It is a Rhodamine 6G 4 mirror ring-type laser with a pulsed xenon ion laser pump and with the 5960Å output line of the xenon laser as the injected light source. The injection locking dye laser output strength and spectral characteristics are studied.

EXPERIMENTAL STUDY OF THE HIGH EFFICIENCY LASER DYE DCM

Shao Ziwen, Yue Chuanhua, Ma Meili (Shanghai Laser Technology Research Institute)

Most recent experimental results on the high efficiency laser dye DCM in the red light region are introduced, including the tuning characteristics, conversion efficiency and fluorescence lifetime, etc.

DISTRIBUTED FEEDBACK DYE LASER

Dong Gengfa, Li Yufen, Jin Yaogen, et al (Physics Department, Fudan University)

In this paper we introduce a tunable distributed feedback dye laser with no wavelength selection element, that is simple and compact. The selection and tuning of wavelength is realised through the incrementally tunable periodically structured Bragg scattering in the dye.

ROOM TEMPERATURE BRANCH SELECTION CO₂ LASER WITH A LIFETIME IN EXCESS OF 6500 HOURS.

Zhang Shuenyi, et al (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We report in the paper a sealed room temperature CO₂ branch selection laser with a lifetime already exceeding 6500 hours which may be even longer.

HIGH POWER LONG LIFE HeCd LASER

Qu Shipu (Shanghai Laser Technology Institute)

We report on the experimental result of using a special technique to obtain high power long life HeCd laser. We developed a laser with a discharge length of 140 - 150 cm and single mode maximum output in excess of 100 milliwatt. A laser of discharge length 125 cm has an experimental life in excess of 3500 hours.

FIXED AND TUNED INFRA-RED LASING RADIATION OBTAINED THROUGH THE NON-LINEAR EFFECT OF ALKALI METAL VAPOR

Lin Yuanqi, Qin Lijuan, Wang Zhugeng (Physics Department, East China Normal University)

Through the non-linear polarizability characteristics of alkali metals, we have converted visible light laser to the infra-red region to obtain coherent infra-red radiation.

CONTINUOUS WAVE METHANOL FOR INFRARED LASER

Fu Ensheng, Wang Zhongzhi, Shi Piesheng (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

Optical pumping continuous wave methanol for infra-red laser at 70, 119, 392, 418, 570 micron wave length with maximum power of 12 milliwatt output is obtained.

LASER ACTION IN INDIUM HOLLOW CATHODE DISCHARGE

Lin Fucheng (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

Lasing action with wave length 468.1, 689.2, 1342.8, and 1720 milli-microns is produced in hollow indium cathode discharge lasing light, where the continuous 468.1 milli-micron and 1720 milli-micron lines are stimulated by charge exchange effect and the 689.2 milli-micron continuous ion line is stimulated by level associated radiation. The 1342.8 milli-micron atomic line appears during the afterglow stage of the pulsed discharge. Its particle number inversion is produced by the recombination of indium ions and electrons.

NEW ULTRAVIOLET CHLORINE LASER OSCILLATION

Qui Mingxin, et al (Shanghai Laser Technology Institute)

5 new Chlorine ion ultraviolet laser spectral lines are reported. Observations have shown that the broadening of the 263.3 milli-micron exceeds 30% per meter.

FOUR NEW OXYGEN ULTRAVIOLET LASER SPECTRAL LINES

Zhou Zheng Zhuo, et al (Shanghai Laser Technology Institute)

Four new laser spectral lines 305.9, 370.3, 372.7, and 375.7 milli-microns are reported. The laser pulse width of the 372.7 milli-micron line is measured to be one order of magnitude larger than discharge pulse width, hence it is a recombination laser light.

TWO CHANNEL TUNABLE SYNCHRONOUS PUMPING SUPER-SHORT PULSED LASER

Cui Juenwen, Li Quen, Hui Ling kai, Liu Songhao (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We reported a second harmonic pumping two channel dye laser using active - reactive lock mode phosphate Nd glass laser and obtained experimental result on tunable super-short pulses.

AN ARGON ION LASER WITH A NEW STRUCTURE

Liang Sheng (Shanghai Yaming Light Bulb Factory Research Laboratory)

We report in this paper our newly designed argon ion laser with a new structure which is improved from the original argon laser, based on the domestic practical situations and those in our own factory

and on the structural characteristics of CR-8. The unit is reported to work well after being used by various related units. The output power of the laser has reached 6-8 watts, and its lifetime is in excess of 700 hours. The design prototype has been approved and production in planned quantities is now possible.

EXPERIMENTAL STUDY ON HIGH REPETITION FREQUENCY ACOUSTICO-OPTICAL Q SWITCHED YAP LASER

Gong Huanming, Tang Cunming (Shanghai Laser Technology Institute)

We have measured the optical polarization, beam quality, pulse width and optical pulse peak power of a high repetition frequency acoustic-optical Q switched Nd YAP laser. In our mode selection experiment, we obtained single mode output. /96

SILVER ION HOLLOW CATHODE ULTRAVIOLET 3181 Å LASER

Mo Yingan (Physics Department, Fudan University)

A continuous and pseudo-continuous working ultraviolet 3181 Å silver ion hollow cathode discharge laser is described. The apparatus structure and some experimental results are reported.

MATERIAL AND ELEMENT

MAGNETO-OPTIC PROPERTIES OF $(\text{BiPrGdYb})_2(\text{FeAl})_2\text{O}_{12}$ SINGLE CRYSTAL THIN FILM AND ITS APPLICATION.

Liu Xianglin, Wang Hongxiang, Yuan Yuanji, Zhu Zhengzhou (Shanghai Metallurgical Institute, Academia Sinica)

The θ_r/d of $(\text{BiPrGdYb})_2(\text{FeAl})_2\text{O}_{12}$ single crystal thin film at 6328 Å is as high as 3.69~4.05°/dB. This property has been applied to optical modulation.

LITHIUM NIOBIATE TRANSVERSE ELECTRO-OPTIC MODULATOR

Fang Zheng, et al (Shanghai Laser Technology Institute)

We introduced the design and experimental result of a Lithium Niobate Electro-optical modulator. Because a suitable structure and processing technology are taken into consideration, such good characteristics as low driving potential and high contrast ratio have been obtained. Tested with a HeNe laser of 1.5 milli-watt and 1.5 milli-radian divergence angle, the half wave potential of single crystal Lithium niobate modulator is 360 volts with contrast ratio 800: 1; for a double crystal lithium niobate modulator, the half wave potential is 180 volts with contrast ratio 500:1.

OPTICAL ANISOTROPY OF $\text{BaAl}_2\text{O}_4:\text{Cr}^{3+}$ SINGLE CRYSTAL

Wu Guangzhao, Zhang Xiurong (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

Energy levels and optical anisotropy of a $\text{BaAl}_2\text{O}_4:\text{Cr}^{3+}$ laser crystal are discussed with group theory.

DEVELOPMENT OF A LEAD MOLYBDENATE ACOUSTO-OPTIC MODULATOR

Hua Wangxiang, Bian Huian, Tan Haoran (Shanghai Silicate Institute, Academia Sinica)

The working principle, apparatus design and process flow of a lead molybdenate acousto-optic modulator are reported and its properties are tested.

LiNbO_3 -ZF₆ GLASS ACOUSTICO-OPTICAL MODULATOR

Fang Zheng, et al (Shanghai Laser Technology Institute)

In this paper we introduce the design of an acoustico-optical modulator with ZF₆ glass as the acoustico-optical medium and a 36° Y cut LiNbO_3 crystal as the electro-acoustical energy exchanger. A method to improve diffraction efficiency and lower driving power is proposed. A satisfactory result has been obtained.

STABILIZING He-Cd LASER OUTPUT WITH ACOUSTICO-OPTICO SERVO CONTROL SYSTEM

Lü Jianhua, Jian Jialin, Zhu Sanyou (Shanghai Laser Technology Institute)

We describe in this paper a set-up to stabilize He-Cd Laser power and lower noise with an electronic servo-system-controlled acoustico-optical modulator as optical feedback. It has also an optical isolation effect at the same time. The principle is that, after an optical feedback is applied to the acoustico-optical modulator, the compensating Bragg diffraction light intensity has reached a stable value. This technique may be generalized and be applied to other types of lasers.

STABLE LASER OUTPUT WITH AN Nd:YAG CAVITY MULTIPLE FREQUENCY LEAK COMPENSATION Lu Jian Hua et al (Shanghai Laser Technology Institute)

In this paper, the multiple frequency in a $\text{Ba}_2\text{Na}(\text{NbO}_3)_6(\text{BNN})$ cavity is used as a leak compensation element to stabilize the 1.06 micron YAG laser output. Two continuous pumping sources with different accuracies are tested and compared. There is a clear improvement in the power stability when the multiple frequency compensation stability method is applied. The total output noise spectral range is also inhibited, especially the lower frequency portion with noise frequency at <100 Hz. In the experiment it has also been discovered that the demand on the accuracy of the matching temperature for the multiple frequency compensating element is not high. In addition, since the leakage second harmonic power is small, there is no apparent decrease in the useful power of the 1.06 micron laser. Hence our method is a practical and useful stabilizing method.

STUDY OF OPTICALLY INDUCED DOUBLE REFRACTION EFFECT IN GLASS

Zheng He, Zhang Meizhen, Li Chengfu (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

Some domestic research results on the optically-induced double refraction effect in optical glasses and laser glasses are reported.

NON-LINEAR OPTICAL PROPERTIES OF SINGLE CRYSTAL SULPHONATED SALICYLIC ACID

Wang Gongming, Jiang Xiengmei, Wang Wencheng (Physics Department, Fudan University)

A measurement method for refractive index and non-linear multiple frequency coefficient of a bi-axial SN crystal is reported. The three high refractive indices and multiple frequency coefficients d_{31} and d_{32} at 0.53 micron, 0.63 micron and 1.06 micron for the crystal are given, and the non-linear optical properties of SN crystal are evaluated.

PRELIMINARY STUDY OF THE NON-LINEARITY OF LEAD SULFATE (PbS) DETECTOR.

Yang Shao Bao Xue Cheng (Shanghai Testing Technology Institute)

The testing method and experimental set-up of the non-linearity of lead sulfate infra-red detector are described.

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SPECTRAL ANALYSIS FOR $MgO:Ni$ BETWEEN 0.35 MICRON - 1.5 MICRON

Zhang Quren Fang Peiyin Fang Shugan Fang Juenxin (Applied Physics Department Shanghai Jiaotong University)

We report in this paper on the results of measurements and analysis of the absorption spectrum and emission spectrum in the range 0.35 - 1.5 micron of a $MgO:Ni^{2+}$ multi-crystal sample.

GREEN LIGHT AUTO-gate OPEN PHENOMENON IN OPTICO-ELECTRIC SWITCH

Gao Funyuan Wang Wenyao et al (Shanghai Institute of Optics and Machinery, Academia Sinica)

We report on the green light auto gate open phenomenon in an optico-electric switch and analysed the cause for its occurrence.

OPTICO-ELECTRIC SWITCH WITH PICO SECOND ACCURACY AND ITS APPLICATION

Chen Lanrong Zhu Xinmin Zhi Tingting Zhu Xiaochun Cao Gendi Wang Hailong (Shanghai Institute of Optics and Fine Machinery, Academy Sinica)

A sub nanosecond electric pulse with the same accuracy as the lock-mode laser is obtained by illuminating high resistive GaAs respectively with the 1.06 micron and the 0.53 micron single super short optical pulse after frequency multiplication from a reactive lock-mode Nd:YAG. The amplitude is 1:Kv and the pulse width is less than the time discrimination limit of the Tektronix 7904 oscilloscope.

BIAS VOLTAGE AUTO CONTROL OF ELECTRON-OPTIC MODULATOR

Weng Wenquan Chen Xiliang (Shanghai Laser Technolohg Institute)

The principle of bias voltage automatic control when the work point of an electro-optic modulator is chosen at the valley (or peak) of sine square curve is described. By this we mean the application of positive and negative pulses of equal magnitude and opposite direction to the electro-optical modulator. If the work point floats, then the two corresponding output pulses of the electro-optic modulator are no longer equal, and control may be executed through the difference value.

We propose a practical method for bias voltage automatic control with a satisfactory experimental result, which reduced floating by more than 30 times and hence solved the problem of long term stability of electro-optical modulators.

HOLOGRAPHY AND THIN FILM TECHNOLOGY

3-D DISPLAY OF ONE STEP RAINBOW HOLOGRAM WITH FRESNEL LENS

Chen Shanhua Yao Wenhua Jia Yuruen (Fudan University)

One step rainbow hologram taken with a Fresnel lens is reported. The hologram will give a 3-D holographic image of an object in white light. The viewing angle is about 50°.

QUANTITATIVE ANALYSIS OF THE VIBRATIONAL AMPLITUDE OF A VIOLIN BRIDGE WITH STROBOSCOPIC HOLOGRAPHIC INTER-GEROMETRY.

Bao Niakeng Ding Zuquan (Structural Theory Institute, Tonji University).
Wang Ming Zhu Shuilin (Electric Engineering Department, Togji University)

We propose a new method for a quantitative analysis of 3-D vibrational amplitude by combining the strobo-holographic interferometry using a single hologram with the holographic fringe 3-D counter developed by us in recent years. Through the quantitative analysis of the vibrational amplitude of good quality violin bridges, it is shown that the method is applicable to such areas as product quality control and quantitative analysis of the fatigue crack expansion in a structure and of non-contact vibration in various fields of bioengineering.

REALTIME DETECTOR OF HOLOGRAPHIC DEVELOPMENT DENSITY

Optical Group, Physics Research Lab, Tongji University

In this paper, we propose an apparatus that is capable of detecting in realtime the holographic negative development density, and hence the development density of holographic negatives may be better controlled to insure better diffraction efficiency in various kinds of holograms.

DEVELOPMENT OF CLASS 20 DENSITY UNIFORM ECHELON AND THE PARAMETERS OF THE TRANJIN HOLOGRAPHIC NEGATIVE

Chen Huifen Zhang Zhiming (Fudan University)
Yu Chongxiu (Beijing Telecommunication University)

The method for developing density range $D=4$, class 20 uniform echelon is reported. With this echelon, more satisfactory results are obtained when parameters of domestic holographic negatives are measured.

SELECTION OF METHODS OF CORRECTION CALCULATION FOR HOLOGRAPHIC PHASE ABERRATION

Zheng Hui (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

With correctness and error in the practical results, we demonstrated the necessity and theoretical base for the selection of methods to correct the phase aberration in Lohmann holograms.

RECORDING LIPMAN HOLOGRAM WITH RED-LIGHT SENSITIZED DICHROMATE EMULSION

We reported on the red light sensitization of dichromate emulsion using methylene blue as sensitizing agent and described the experimental method for the preparation and processing of the sensitized emulsion. A holographic grating is taken with a HeNe laser red light and a diffraction efficiency of 84% is obtained. At the same time, Lipman holograms are made which can be viewed in white light in preparation for implementing chromatic white light viewing.

HOLOGRAPHIC COMPUTATION: ZERO POSITION CHECKING OF NON-SPHERICAL WAVE FRONT

Chen Zhongyu Zheng Hui (Shanghai Institute of Optics and Fine Machinery Academia Sinica) Zhuang Yilin (Shanghai Laser Technoloh Institute)

This paper describes "zero position" checking for a non-spherical wave front with a computer-produced hologram as sample. The accuracy may reach about $\lambda/10$

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THIRD CLASS ABERRATION IN RAINBOW HOLOGRAM AND THE EFFECT OF $\Delta\lambda_2$ ON A MAGNIFICATION AND 3RD CLASS ABERRATION.

Zhang Youwen Zhu Weiguang (Jiaoton University, Shanghai).
Zing Yingjie (Beijing Industrial University)

We discussed the 3rd class aberration in rainbow holograms and the effect of $\Delta\lambda_2$ on magnification and 3rd class aberration. Parameters can be selected to reduce or eliminate certain aberrations and improve image quality. This is meaningful both in theory and in practice.

CROSS SLIT RAINBOW HOLOGRAM

Zhang Youwen Zhu Weiguang (Jiaotong University, Shanghai)

To overcome the shortcomings of single slit chromatic hologram loss in the normal direction parallex, we reported on the cross slit chromatic hologram made by Zhang Li, et al. under the guidance of American professor Yang Zhenhuan. The cross slit rainbow hologram

will give a rainbow in both normal and horizontal directions and may find new applications in interference calculations.

ANALYSIS ON THE SPATIAL FREQUENCY BANDWIDTH OF SINGLE SLIT RAINBOW HOLOGRAM

Zhang Youwen Zhu Weiguang (Jiaotong University, Shanghai)

The spatial frequency bandwidth of a hologram is limited by the effective hole diameter of the hologram. From the analysis on the resolution and color fuzziness of single slit hologram in this paper, we know that only one dimensional treatment is needed for the discussion of spatial frequencies.

OPTICAL ABSORPTION COEFFICIENT OF MAGNETIC GARNET FILM

Wang Lixuan Wang Yaqi (Shanghai Metallurgical Institute, Academia Sinica)

We proposed an expression for calculating the thin film optical absorption coefficient when background absorption, multiple reflection in film layers and interference effect are taken into consideration.

SINGLE CYRSTAL GOLD FILM WITH NO SUPPORT

Yu Ying Wan Xinnong Li Yuanyuan Shen Yuanhua (Fudan University)

In this paper we introduce the set-up and method of plating single crystal gold film in a vacuum with the foreign material extension method. First mica is used as the substrate. Then a special heating aparatus and optical method for measuring thickness are used to obtain Ag and Au films of known thickness. Lastly a (111) single crystal gold film without support of thickness about 500 Å is obtained by the erosion method.

PROPERTIES OF TITANIUM DIOXIDE THIN FILM AND ITS APPLICATION IN THE LASER

Peng Jiajn (Shanghai Laser Technology Institute)

We reported on the properties of a titanium dioxide thin film and the results of its application in a laser. Experiment indicates that it is superior to similar soft films.

DETECTION AND LOWERING OF OIL VAPOR IN FILM DEPOSITION VACUUM CHAMBER.

Xin Zhongqing Wan Xinquan Yu Ying Xu Xinmin Shen Yuanhua (Fudan University).

Based on the principle of the sensitive relationship between the secondary emission coefficient of a metal and its surface pollution, we efficiently detected the existence of oil vapor in the vacuum chamber using a simple electron gun and nickel target that we constructed, and proved that the oil vapor in a film deposition vacuum chamber mainly comes from the mechanical pump. We installed at the air inlet of the mechanical pump a self-regulating molecular sieve oil trap and effectively lowered the oil return phenomenon.

MEASURING TECHNIQUE

DETERMINATION OF AN ANGULAR POSITION AND NUMBER OF REVOLUTIONS WITH SIMON BI-FREQUENCY LASER

Lin Qinbo (Shanghai Laser Technique Institute)

Measuring the number of rotations of a rotating body with a Simon bi-frequency laser with an accuracy better than 1×10^{-5} is introduced. For angular position determination, the accuracy may reach $\Delta\phi = \pm 5'$. This method is also suitable for measuring the dynamic twisting distortion of large scale rotating axis, especially at a high rotating speed (several hundred thousands of revolutions/minute).

A SELF-REGULATING MICRO-LASER BEAM STIMULATED FLUORESCENCE METER - MEASURING THE LATERAL MOVEMENT OF PROTEIN ON ALL OF A SURFACE

Sun Weili Zhang Konghua Zhang Boxim (Shanghai Cell Biology Institute, Academia Sinica)

The purpose of this work is to develop equipment to determine quantitatively the lateral diffusive motion of protein molecules on the membrane of a cell surface - a micro-laser beam stimulated fluorescence meter - to study the life activities of a cell. We have measured with this set up the lateral diffusion coefficient of globulin protein acceptor on cancer cell surface.

NUMERICAL THERMAL-ELECTRIC EFFECT LASER PULSE ENERGY METER

Zhu Qin (Shanghai Injector Factory Number 1)

A unique numerical laser pulse radiation energy meter utilizing the distributed capacitance characteristic of a PZT thermal-electric element with large surface area is described. Its electronic circuitry is simple and reliable and can be easily integrated and miniaturized. The apparatus is suitable for the rapid measurement of medium to large power short pulsed laser energy.

PRINCIPLE OF LASER DIFFERENTIAL FREQUENCY PHASE INTERFEROMETRY AND ITS APPLICATION

Zhu Qin (Shanghai Injector Factory Number 1)

The principle of a new method for receiving and processing of laser dynamic interferometric messages is introduced. This principle is used with success in the measurement of the diameter parameter of thin optical fibres in high speed motion. Several ways of applying this principle in other disciplines are proposed.

A THERMAL ELECTRIC DETECTOR AND ITS APPLICATION

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Wang Keqin Chen Renliang Xiao Mingqiong Li Hailun Zhou Songdi
(Shanghai Laser Technology Institute)

The CO₂ thermal electric detector we developed scans the cross-section of the continuous CO₂ laser beam with the detector receiving element and records on a recorder the output signal of the

electric detector. The light intensity can be measured and the speckle size, divergence angle and other laser parameters can be computed. We report on the measured result of CO₂ laser parameters and the experimental results are analyzed and discussed.

CAUSES OF ERROR IN THE DEFLECTOR OF A LASER FLOW DETECTOR AND HOW TO TREAT THEM.

Xu Hiuren Gu Piede (Shanghai Laser Technology Institute)

We discussed the cause for the errors produced in the vibrating mirror, in particular the degree of linearity, repeatability, retardation, and temperature drift. To improve the properties of the vibrating mirror, we adopted corresponding strategies. In this paper we emphasize the discussion on the closed ring circuit, the transducer circuit and the constant temperature circuit.

MEASUREMENT OF FARADAY ROTATION OF GARNET SINGLE CRYSTAL THIN FILM
Feng Jingzhang Yuan Yuanji Zhu Zhengzhong (Shanghai Metallurgy Institute, Academia Sinica)

The Faraday rotation of a singly crystal garnet thin film is measured with a magneto-optical modulator. The measuring system is simple and sensitive, with reading accuracy of $\pm 0.005^\circ$ and error $\leq 5\%$.

STUDY ON EXPERIMENTAL METHOD FOR MEASURING THE INSTANTANEOUS VELOCITY OF ROTATING SHAFT WITH A LASER.

Liu Yingchun (Optical Measurement Section, Research Institute 711)

We introduce the method of using a laser speckle and Doppler frequency shift technique to measure the instantaneous velocity of a rotation shaft and the analysis of experimental data.

MEASURING ELECTRON DENSITY IN A GASEOUS DISCHARGE TUBE WITH MICROWAVE INTERFEROMETER.

Wang Yuzhi (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We measured the electron density in a gaseous discharge tube with a 3 cm microwave interferometer, studied the effect of the discharge current, the pressure and various gases introduced on the electron density.

DETERMINATION OF TIME SYNCHRONIZATION OF 6 LASER BEAMS WITH THE TWO PHOTON FLUORESCENCE METHOD

Yu Wenyan Xie Xinmin Li Anmin et al (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We measured the time synchronization of a 6 beam neodymium glass, high power laser system (6x11³³Watt) with the two photon fluorescence method. The synchronization error is 10 picosecond.

NEW APPLICATION OF THE TWYMAN INTERFEROMETER TO THE EXAMINATION OF SOLID STATE LASER MATERIAL

Li Xishan Jiang Anmin Xia Qingsheng (Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We discuss the condition of solving the simultaneous equations of the reflection and transmission interference of a sample in the Twyman-Green interferometer and the application of the equations.

NATIONAL STANDARD HARDNESS METER'S PRINCIPLE LASER MEASURING SYSTEM

Chen Mingyi Sun Gueiquing (Shanghai University of Science and Technology).

We introduce the working principle of the principal laser measuring system of the national standard hardness meter. Several characteristics in the design of the system are described. Finally the error in the principal measuring system is analysed and calculated.

CALCULATION OF BI-AXIAL CRYSTAL MULTIPLE FREQUENCY PHASE MATCHING ANGLE AND EFFECTIVE NON-LINEAR COEFFICIENT

Xie Chengwu (Department of Applied Physics, Jiaotong University, Shanghai)

Based on a simple description of the principle of bi-axial crystal phase matching, we derived the computational formula for d_{ij}^L, d_{ij}^H of 5 kinds of point group biaxial crystals including monoclinic m and triclinic 1, and compiled two source programs that can calculate on a DJS-6 computer the multiple frequency phase matching angle and effective non-linear coefficient. Calculations have been carried out for 8 types of bi-axial crystals such as: Barium, Sodium, niobate, etc. Experimental and calculated results for multiple frequency phase matching of monohydrate Lithium formate and Barium Sodium Niobate, monohydrate are in agreement with one another.

DETERMINATION OF PIEZOELECTRIC TRANSDUCERS f_s IN BODY WAVE ACOUSTICO-OPTICAL ELEMENTS

Sun Zhongjian (Physics Department, Tongji University)

The working frequency of the Piezoelectric transducer in body wave acoustico-optical elements must be selected at its mechanical series resonant frequency f_s . We gave the method for determining the transducer f_s and indicated its meaning.

LASER APPLICATION

LASER DOPPLER VELOCITY MEASUREMENT APPARATUS CAPABLE OF DIRECTION DETER- MINATION

Tang Kiayuan Xu Xuming Zhang Zidong Sun Yusheng (Shanghai Laser Technology Institute)

We introduce a Doppler velocity measuring apparatus capable of directing flow direction, which has been successfully operated in the laboratory. A small scale experimental water tunnel is measured with

the apparatus. The flowing object velocity changes can be well traced and the velocity directions sensitively differentiated. The measured result with analysis and discussion are presented in this paper.

APPLICATION OF LASER(THEODOLITE) TRANSIT INSTRUMENT IN THE INSTALLATION OF ALUMINUM LIGHT WEIGHT MAST

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Ye Renyun (Shanghai Ziuxim Shipyard)

A laser theodolite is used in an alignment and equal angle bisection method to solve the problem that aluminum light weight masts twist easily and are hard to install.

RESISTANCE ADJUSTMENT WITH YAG ACOUSTICO-OPTICALLY MODULATED Q LASERS

Lu Shizhen Shen Zhendong Li Fujin Wu Dongfeng Wei Jieyun (Shanghai Laser Technolohg Institite)

In this paper we summarized the optical system principles of fine tuning apparatus for thick and thin film circuits with YAG acoustico-optically modulated Q lasers. The advantages of laser resistance adjustment, its technology and parameters affecting laser resistance adjustment accuracy are given and 2 practical examples are listed.

HOLOGRAPHIC NON-DESTRUCTIVE TESTING OF A METALLIC THIN-WALLED CYLINDER

Gu Huizhen Li Ming (Shanghai Centrifuge Machinery Institute)

A preliminary result of holographic non-destructive diagnostic testing of a metallic thin-walled cylinder is introduced.

AN INERTIA GUIDANCE PLATFORM LASER HORIZONTAL DRIFT DETECTOR

Ye Tianmin (Shanghai Marine Apparatus Manufactory)

An inertia guidance platform laser horizontal drift detector

is used to measure both the static and dynamic relative horizontal level accuracy of an inertia guidance platform. The accuracy, working principle and characteristics of such an apparatus are discussed.

MATRIX LASER TRACING APPARATUS

Zhong Junyi (Shanghai Xinyao Meter Manufactory)

A matrix laser tracing apparatus is introduced. It works in a linear electro-slide state. To control signal, one needs only consider the phase information of the laser spot on the laser detector and not the absolute distance information from the laser spot to the center of the detector. Thus, a wave clipping technique may be used to eliminate the AM interference in processing the laser signal. Numerical integrated circuits may be used for signal processing, making the method simple and reliable.

COMPARISON OF TWO METHODS OF LASER DIRECTION DETERMINATION

Zhong Junyi (Shanghai Yaoxim Meter Manufactory)

We have compared the laser signal parametric expressions for the 2 cases of disc-like speckle and ring shaped speckle laser images on the detector and the 2 cases of horizontal or 45° angle installation of the 4 quadrant tube detector and discussed the 2 methods of laser direction determination - sum and difference circuit method (i.e. 45° angles installation of detector)

LASER IN MEDICINE

STUDY ON THE VAPORIZATION OF EXPERIMENTAL LIVER CANCER WITH CO₂ LASER

Wang Dezhaoli Li Yongfang (Surgery Educational Research Lab, Huashan Hospital, Medical School Number 1, Shanghai)

We have studied the effectiveness of liver cancer vaporization by 10.6 micron laser and observed experimentally the vaporization of

transplanted rat liver cancer nodes and those induced by cream salt. It is demonstrated that continuous measurement of AFP concentration may be used as evaluation data for vaporization treatment of AFP positive cellular liver cancer. The limitation of laser vaporization of cancer liver is also discussed.

PRELIMINARY OBSERVATION OF MAKING CO₂ LASER KNIFE SURGICAL INCISION WITH ISOTOPE GELATIN GOLD

Yu Chibing (Long March Hospital, Second University of Military Medicine)

To investigate whether the lymph tube can be sealed after CO₂ laser surgery to avoid lymphatic drain, we treated 5 patients by using CO₂ laser knife surgery. A preliminary observation has been carried out with isotopic gelatin gold marking the incision.

EFFECT ON REPRODUCTION AND OVARY FUNCTION AFTER He - Ne LASER ILLUMINATION OF THE OVARIES

Ding Aikua, et al (Gynecology/Obstetrics Hospital, Shanghai Medical College Number 1.)

Chen Huiling et al (Physiology Institute, Academia Sinica)

Wang da et al (Cytology Institute, Academia Sinica)

In this paper we focussed on the problem of safety during HeNe laser local irradiation or needle point irradiation, and carried out clinical observation and comparison on the ovary function of a sterile patient due to inflammation of related organs and on the state and fertility of the animal ovary. It is pointed out that the effect dosage of the HeNe laser in current treatment is within the safety range and will not cause any physiological effect.

EFFECT OF HeNe LASER HIND QUARTER IRRADIATION ON THE VELOCITY OF BLOOD FLOW AND CAPILLARY PERMEABILITY OF DOMESTIC RABBITS

Ding Aihira, et al (Obstetric/Gynecology Hospital, Shanghai First Medical School)

Jin Huizhang et al (Physiology and Health Education Research Section,
Shanghai First Medical School)

It is proposed in this paper that the reason why HeNe laser treatment of an inflammation of related organs is getting clinical results may be related to the improvement of circulation in a micro region. From experiments on the effect of lasers on domestic rabbit blood flow velocity and capillary permeability, we also studied the possible mechanism of curing inflammation of related organs by HeNe laser local irradiation on the hind quarter.

STUDIES ON THE ABSORPTION SPECTRUM OF HUMAN CANCER CELL

Laser Medicine Research Laboratory, Shanghai Medical School Number 1.

To cure cancer with a laser, it is necessary first of all to understand the absorption spectrum of the cancerous system so that better and more effective treatment may be obtained by selecting matching wave lengths based on its own spectral characteristics. Thus it is important to analyse various cancerous spectra in order to use the laser. We reported the study on the spectral analysis of human cancer cells.

PRELIMINARY OBSERVATION ON THE SPECTRAL EFFECT OF TUNABLE DYE LASER ON ARS CANCER, EHRILICH ABDOMINAL WATER CANCER CELL SENSITIVITY INHIBITION /101

Yang Fushou (Shanghai Sailor's Hospital)

Wang Quida (Shanghai Cell Biology Institute, Academia Sinica)

Xu Dawen Li Fengying (Shanghai Laser Technology Institute)

Ren Yunfeng (Shanghai Drug Institute, Academia Sinica)

We introduced the phenomena of growth inhibition, feature change etc. of ARS cancer and Ehrlich's abdominal water cancer cells under the effect of tunable dye laser ($4727-5365 \text{ \AA}$) and discovered that the cells are specially sensitive to certain spectral lines.

PRELIMINARY REPORT OF THE EFFECT OF LASER ON CANCER CELL RNA

Liu Demin et al (Laser Medicine Laboratory, Shanghai Medical School Number 1)

Yang Fushou (Shanghai Sailor's Hospital)

Chen Zhasping Zhou Yiping et al (Eye, Ear, Nose, Throat Hospital, Examination Department, Shanghai Medical School Number 1.)

Qu Zhipu et al (Shanghai Laser Technology Institute)

In order to investigate the mechanism of laser effect on cancer cellmacro-molecules, so that it may be used in clinical practice with improved results, we reported in this paper the result of a laser induced effect on cancer cell RNA.

DEVELOPMENT AND DESIGN OF ARGON LASER FLOWING CELL ANALYSIS SYSTEM

Xu Songlin Pan Jiapu Shi Guiying Qian Suiyun Zho Reipeng
Qin Jianan (Shanghai Medical School Number 2)

Argon laser light wave length 4880 \AA interacts after focussing with dyed cells that flow rapidly and stably and stimulates the fluorescence from the cell. The cellular fluorescence is then converted by an opto-electronic multiplier tube into electric signals which are then numerically processed. A large amount of cellular statistical characteristics may be extracted from the histograms of numerical DNA variations in the cell displayed or printed. The principles and structures of various parts of this system together with experimental results are described in this paper.

PRELIMINARY STUDY ON THE "DEQI" EFFECT OF He-Ne LASER NEEDLE AND OBSERVATIONS DURING CLINICAL TREATMENT

Liu Defu Xu Jichang Zhao Huifen Han Jianmian Sun Zhenfeng
(Ruijin Hospital, Shanghai Medical School Number 2)
Wan Xinnong Chen Genfu (Fudan University)

Our experiment using He-Ne laser beam as optical needle with

"Deqi" effect is described. After the laser beam is irradiated upon the Hegu needle point 1'30"-10' (average 4 to 5 minutes), an "electric signal" is received at Quchi needle point on the same vein, while no signal can be detected at the Chizhe needle point on a different vein. We also described the observational result before and after irradiating with the optical needle the appropriate needle points of patients for curing menstrual pain, platelet decrease, and excessive menstruation.

OBSERVATION ON THE EFFECT OF YAG LASER OPTICAL NEEDLE UPON CANINE VOCAL CHORD AND TONGUE TISSUE

Laser Medicine Research Laboratory, Shanghai Medical School Number 1

Irradiation of canine vocal chord and tongue tissue with a 1.06 micron YAG laser through an optical coupling system with single filament quartz optical fibre has been carried out to observe the instantaneous change and changes after healing of the tissue for various laser dosages.

CLINICAL SUMMARY OF TREATING DIGESTION SYSTEM DISEASES BY IRRADIATING NEEDLE POINTS WITH ARGON LASER

Hu Ronghua (Yueyang Hospital)

Preliminary clinical observation of treating "Cirrhosis abdominal water" with CO₂ laser irradiation supplemented with traditional medicine
Mao Dingbo Yang Binkui Xu Yongyuan Tang Weiyuan Zhang Xingying
Zhang Chonghy (Jiading County Central Hospital)

Venous "Cirrhosis persistent abdominal water" is a common chronic disease. Since the beginning of this year, we treated 20 patients with cirrhosis persistent abdominal water by irradiating with expanded CO₂ laser beam, supplemented with traditional medicine to improve blood circulation. The results are satisfactory.

PRELIMINARY RESULT OF TREATING SILICOSIS WITH CO₂ LASER

Laser Laboratory, Third People's Hospital, Shanghai Medical School

Number 2, Shanghai Bureau of Metallurgy, Professional Disease Research
Institute Laser Laboratory, Shanghai Medical School Number 2

We report on 13 cases of silicosis patients who received irradiation from CO₂ laser of power density 113 mW/cm² on the area of lower lung area near the center of the back. Each time the irradiation lasted 10 minutes, once on the right side and once on the left with the total number of irradiation 36 - 46 times. After irradiation the breathing passage symptoms of the patients improved with increased level of C₃ and total lining. It is yet too soon to draw any conclusions concerning the effectiveness of the treatment. Further observations are required

PRELIMINARY INVESTIGATION OF TREATING BRONCHIAL ASTHMA WITH HeNe OPTICAL FIBRE NEEDLE

Fu Chaizhi (First Hospital, Shanghai Bureau of Textile Industry)

60 cases of bronchial asthma have been treated with a He-Ne optical fibre needle with 2 years of clinical observation. 21.6% are cured, 66.7% effective and 11.7% with no effect. The cure is effective.

CLINICAL APPLICATION OF LOW POWER He-Ne LASER

Lu Lanyi (Accupuncture Department, Wusong Central Hospital)

CLINICAL OBSERVATION OF LASER IN ARTIFICIAL ABORTION TECHNIQUE

Hu Shizheng (First Women and Children Health Care Center, Shanghai) /102

In artificial abortion technique, irradiation on needle point by HeNe laser relaxed the uterus opening and reduced pain. The percentage of relaxation reached 86.3% and pain reduction rate reached 84.64%

SOME EXPERIENCE ON THE DEVELOPMENT AND APPLICATION OF He Ne LASER LASER OPTICAL FIBRE NEEDLE /1

Medical Laser Research Laboratory, East China Hospital

For the study of a pulsed laser optical needle in clinical treatment, we have developed a pulse optical needle apparatus and are testing it clinically. The laser tube of this apparatus is 2 milliwatt. When converted to pulses, the peak power at 1-10 Hz may reach 10-30 milliwatts. The frequency of our machine reached 1-200 Hz. We are in the process of determining the peak power at various frequencies and the tissue penetration depth.

MEASUREMENT OF LASER FLUORESCENCE SPECTRUM OF STOMACH CANCER

Laser Research Laboratory, Physics Department, Fudan University
Shanghai Clinical Apparatus Research Institute
Cancer Department, Changning Area Central Hospital, Shanghai

We measured the stomach cancer fluorescence spectrum stimulated by a nitrogen laser and discovered a cancer characteristic peak in the neighborhood of 6000 Å in addition to the normal fluorescence peak. The experiment indicates the possibility of using laser induced fluorescence in stomach cancer diagnosis.

CLINICAL APPLICATION OF ARGON ION LASER OPTICAL FIBRE

Laser Medicine Research Laboratory, Shanghai Medical School Number 1.

We report on an Ar^+ laser optical fibre apparatus we developed in collaboration with Yaming Lightbulb Factory, Xinhua Glass Factory, etc. A clinical application based on animal tests has yielded some results, especially for treating diseases of the blood vessel system.

LASER IRRADIATION TREATMENT OF COMMONLY SEEN DISEASES OF THE VOCAL CHORD

Laser Medicine Research Laboratory, Shanghai Medical School Number 1.

We treated with He-Ne laser and CO_2 laser irradiation method common diseases of the vocal chord such as vocal chord muscle, chronic

laryngitis, vocal chord nodule etc, and obtained good results.

TREATMENT OF CHRONIC LARYNGITIS WITH HeNe LASER OPTICAL FIBRE

Lu Junan, Jiang Haoming, Guan Ruzhen, Ding Zuxing (Wusong District Central Hospital)

Chronic laryngitis is a common disease. We treated the patients by irradiating directly their throats with HeNe laser optical fibre. For 43 cases of different types of this disease, satisfactory results have been obtained.

CO₂ LASER TREATMENT OF 36 CASES OF NOSE DISEASE

Fang Shuyou (Hospital 85, Chinese People's Liberation Army)

In our hospital, we used a 30 Watt CO₂ laser apparatus to treat 36 cases of nose disease and obtained good results.

CO₂ LASER TREATMENT OF CHRONIC FATTY NOSE INFECTION

Laser Medicine Research Laboratory, Shanghai Medical College Number 1

We have selected cases where other treatments have failed such as high voltage annealing, cryogenic surgery and partial removal of the lower nose, and applied a CO₂ laser to lower the annealment technique.

TREATMENT OF NEURAL DOUBLE HEARING WITH HeNe LASER

Zhang Yifan Wang Yi Pan Zheng (Laser Laboratory, Shanghai Sailor's Hospital)

We used a HeNe laser in acupuncture for patients with neural double hearing problem to improve their hearing and obtained good results in a short time (one treatment period).

SAFETY PROBLEMS IN LASER MEDICINE

Guan Chongwen (Outpatient Department, Shanghai Institute of Optics and Fine Machinery, Academia Sinica)

We discussed primarily the danger of "reflected light from laser target speckle" on a surgical patient's eye and other protective problems.

APPLICATION OF LASER IN THE EAR-NOSE-THROAT DEPARTMENT (OTOLARYNGOLOGY)

Shanghai Sailor's Hospital, Laser Laboratory

We report on the use of laser in treatment at the Otolaryngology Department in our Hospital.

PRELIMINARY CLINICAL USE OF THE HeNe LASER NEEDLE IN NEUROLOGY

Shanghai Hospital for the Prevention and Treatment of Neurological Diseases

Shanghai Medical Apparatus Institute

Irradiating acupuncture points with a laser needle as treatment for neurological diseases is just in its beginning. Some experience has been accumulated.

ON THE REPORT OF TREATING 2 CASES OF THE DISEASE OF LOWER JAW JOINT FUNCTIONAL DISORDERS WITH LASER IRRADIATION OF ACUPUNCTURE POINTS

Xie Yueyin

TREATMENT OF THROAT AREA SPONGE LIKE HEMANGIOMA WITH Nd:YAG LASER

Meng Zhaohe Yu Baonan (New China Hospital, Shanghai Medical School Number 2)

Ma Baozhang (9th People's Hospital, Shanghai Medical School Number 2)

We report on the Nd:YAG laser treatment of 3 cases of large size sponge like vein cancer in the throat area. The laser's output power is 20-24 Watt. Point wise scanning irradiation was applied to

the cancer which shrank in size apparently. Swelling of the throat and pain was slight. No tracheo surgery was applied for the 2 cases and the result of treatment was satisfactory. A preliminary discussion is presented on the principle, method, reaction and advantages of the treatment.

RUBY LASER TREATMENT OF GUM CANCER

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Xu Yigeng Gong Weizhen Cheng Lizhen (Shanghai Huangpu Central Hospital)

Ruby Laser pulse energy was used to make the tissue absorb congealed protein after its secretion. Treating gum cancer (vessel type) by irradiation with laser film cutter has had satisfactory results.

41 CASES OF TREATING MOUTH MUCUS SAC WITH CO₂ LASER

Yao Yi et al (Fengcheng Hospital, GenXian, Shanghai)

CO₂ laser thermal effect is used to burn the swollen sac, and carbonate it to eliminate the disease. A statistical comparison and analysis are carried out on the 41 cases.

CLINICAL OBSERVATION OF HeNe LASER TREATMENT OF DISEASES OF THE MOUTH

Li XueXiang Ye Meiyan (Mouth Cavity Science Educational Research Laboratory, Shanghai Medical School Number 1)

320 cases of irradiating more than 10 types of mouth cavity diseases with HeNe laser (25 milli watts) are reported. After 2-3 years of follow-up, some diseases have been treated with apparent success, but some require further observations to determine the suitability of the treatment.

TREATMENT RETINA VEIN INFLAMMATION WITH ARGON LASER

Wang Kansun Wei Yuehua Zhang Minghang Shi Xianghe Shi Haiyun Chen Gangqiang (Ophthalmology Department, Ruijin Hospital, Shanghai Medical School Number 2)

19 cases of 22 eyes have been treated with an Ar laser for retina vein inflammation. After treatment, new blood vessels have grown and capillary tumor shrank and in no cases did bleeding recur. Concerning eye sight situation, 12 eyes improved after treatment, 10 remain unchanged. There is no case of eye sight deterioration. 17 had eyesight remain or improve to above 1.0.

CLINICAL APPLICATION OF A LASER SPLIT SLIT LAMP OPHTHALMOLOGICAL MACHINE

Ophthalmology Department 6th People's Hospital, Shanghai

We have succeeded in mounting a ruby laser on a YZ-5A model slit slit lamp microscope, so that they are co-axial. This combination may be used for film removal, closing retina tears as well as for congealing fluorescent leak point, so that it becomes a multipurpose machine. Clinical tests will proceed in the future.

RETINA DETACHMENT AND ARGON LASER TREATMENT

Shi Xianghe Wang Kangsun Wei Yuehua Zhang Mingheng Shi Haiyun
Chen Gangqiang (Ophthalmology Department, Rejin Hospital, Shanghai
Medical School Number 2)

An Argon laser is used to congeal the boundary between the area surrounding the tear and the normal retina, so that scarry ridges are formed on the outskirts of the problem area to prevent its further development. The result is basically satisfactory.

MECHANISM OF CO₂ AND HeNe LASER IRRADIATION TREATMENT OF ULCERS

Ni Shengying Jiang Haoming Zhu Zhongbo Xu Zhichu Zu Meizhen
(Shanghai Wusong Area Central Hospital)

Low power CO₂ and HeNe Laser irradiation is used to treat chronic ulcers, poor healing after surgery, and other kinds of wounds. Results are all satisfactory.

APPLICATION OF CO₂ LASER IN DERMATOLOGY

Yao Yi et al (Fengcheng Hospital, FengXian, Shanghai)

YYJGA model CO₂ laser treatment equipment is used clinically to treat more than 800 cases of 30 types of skin diseases; statistical results for 267 cases are given. Effective rate is 96.3%

SUMMARY ON 350 CASES OF SKIN DISEASES TREATED WITH CO₂ LASER

Cai Chengsui Chen Jinshen (Shanghai Hospital for Postal and Telecommunication Workers)

CO₂ lasers with output power of 30 Watt are used to treat 350 cases of 16 types of common skin diseases such as wart, mole, vein tumor, corn, acne, fibrous tumor, chronic eczema etc. 88% are cured 4% improved and 8% no effect.

TREATING SKIN EXCRESCENCE WITH YAG LASER COUPLED WITH OPTICAL FIBER

Xu Yigeng Gong Weizhen Zhuang Yuexiang (Shanghai Huanpu Central Hospital)

YAG laser of output power 5 watts coupled with single thread optical fiber is used with success in treating skin excrescences.

298 CASES OF LOW POWER DENSITY LASER IRRADIATION TREATMENT

Sun Dongxin Xu Xiyu (Shanghai New China Hospital)

During the past half year, at our hospital, we have treated 298 cases by a CO₂ laser expand beam long distance irradiation and HeNe laser irradiation. The former involved 227 cases and the latter 82 cases. There are 7 cases which have been irradiated with both types of lasers. The diseases treated included skin diseases, surgical cases, obstetric cases and mouth cavity cases. All treatments are effective.

SUMMARY OF CLINICAL APPLICATION OF LOW POWER HeNe LASER.

Li Suenchang (Dermatology Department, 4th People's Hospital, Shanghai)

188 cases of various dermatological diseases have been successfully treated with low power (2-3 milliwatt) He-Ne laser.

CLINICAL ANALYSIS OF CO₂ LASER TREATMENT OF 710 CASES OF SKIN CANCER

Wu Qingzhen (Ruijin Hospital, Shanghai Medical College Number 2)

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ON THE MECHANISM OF THE EFFECT OF TREATING VEIN CANCER WITH ARGON LASER AND MULTIPLE FREQUENCY Nd:YAG LASER

Wu Qingzhen (Ruijin Hospital, Shanghai Medical College Number 2)

Clinical analysis of unsuccessful cases of treating skin membrane ulcer with He-Ne laser irradiation. He Fangde (East China Hospital)
Clinical analysis of cases of skin mucous membrane ulcers not healed by He-Ne laser radiation therapy. He Fangde (East China Hospital)
APPLICATION OF Nd:YAG LASER TO TREAT INTERNAL HEMORRHOID

Zhuo Ruilin Zu Songlin (Shanghai Medical College Number 2)
Shi Qichang Chen Suipin (Shanghai Construction Worker's Hospital)

42 cases of II-III stage "ring" hemorrhoid and type internal hemorrhoid have been treated with Nd:YAG laser. All cases, through follow-up, have had good results with a cure rate of more than 95%.

TREATING INTERNAL HEMORRHOIDS WITH RUBY LASERS

Xu Vikang Gong Weizhen Ma Meirong (Shanghai Huangpu Central Hospital)
Wang Youmin Shan Yijun (Shanghai Xuhui Area Tianpin Hospital)
Tang Aimei Cao Guoqiang Chen Aimei (Shanghai Heli Electric Machine Factory)

A ruby laser membrane remover with pulsed output energy of 6 joules is used in the irradiation treatment of internal hemorrhoids with good results.

CELL SAMPLE PREPARATION ANALYSED BY LASER FLOW ANALYSIS

Shi Zuegeng Liu Binrong Li Zhaozhang (Biophysics Educational Research Laboratory, Shanghai Medical College Number 2)

Cell sample preparation is of paramount importance in cell flow analysis. We have succeeded in carrying out nuclei DNA fluorescence dyeing with Acridine Orange respectively on chicken red blood cells, toad red blood cells, white blood cells in the outer blood of white mice, marrow cells of white mice and white blood cells of the outer blood of rabbits. We introduce the method of cell sample preparation by laser flowing analysis.

CONDUCTION OF CONTINUOUS WAVE RED LASER ENERGY IN SKIN

Liu Zhaorong Li Ahaozhang Wu Jiany (Medical Laser Research Laboratory, Shanghai Medical College Number 2)

We irradiated animal body surface with 2 kinds of continuous wave red laser light while measuring the temperature variations in the tissue in order to find out the relationship between laser energy and tissue damage as well as temperature.

EFFECT OF IRRADIATION ON EAR NEEDLE POINT WITH HeNe LASER ON SALIVA SECRETION

Zheng Zhanpie Ding Weiyuan (Shanghai Hospital for the Prevention and Treatment of Neurological diseases)

20 cases of schizophrenic patients with salivating problems are treated by irradiating the ear needle point with a HeNe laser instead of using acupuncture needles, a method combining modern technology with traditional medical theory. Satisfactory results have been obtained

TREATMENT OF HEMANGIOMA WITH YAG LASER EQUIPED WITH OPTICAL FIBRE

Xu Yigeng Gong Weizhen Zhuang Yuexiang (Shanghai Huangpu Central

Hospital)

A YAG:Na⁺ laser with continuous output power of 15 watts after being equipped with an optical fiber is used in the treatment of vein tumors. The treatment is effective after many times of irradiation.

EFFECT OF CO₂ LASER ON SURROUNDING NERVE DAMAGE

Anhui Institute of Optics and Fine Machinery Worker's Hospital

Laser Medicine Laborator, Shanghai Medical College Number 1.

More than a dozen patients (including puncture wounds and breakage) are cured through CO₂ lasers. Satisfactory results are obtained over different amounts of time. Paralysed limbs have all fully or partially recovered their functions. We consider CO₂ laser treatment of surrounding nerve damage as a method worthy of study.

VAPORIZATION OF BRAIN TUMOR BY LASER

Xu Qiwu Chen Gongbei (Neurological Disease Institute Shanghai Medical College Number 1.)

Operations were performed on 30 cases of patients with cerebral hemisphere tumors applying the CO₂ laser vaporization technique with a minimum power density of 1012-1408 Watts/cm and made a comparison with 20 patients given conventional operative treatment at the same time. Both effectiveness and reaction to the treatment are compared.

INVESTIGATION OF THE LAW GOVERNING PENETRATION OF HeNe LASER THROUGH THE TISSUE

Liu Defu Zeng Zhen (Traditional Medicine Department, Ruijin Hospital, Shanghai Medical College Number 2)

We studied the penetration of He-Ne laser through pork, dead rabbit, cardova and living human body tissue. Experiments showed

that the penetration of He-Ne laser light through a tissue obeys the law of exponential decay. We also measured the decay coefficient of living tissue $\alpha \approx 0.3/\text{mm}$. According to the equation $E_r(L) = E_0 e^{-\alpha L}$, if we know the laser power incident on the human tissue, and have also measured the reflectivity of the skin surface, then the laser power that will penetrate to any depth in the human body tissue may be calculated.

TREATMENT OF DIGESTIVE ULCER, GASTRIC ROT WITH ACCOMPANIED BLEEDING BY ARGON ION LASER LIGHT CONGEALING UNDER INTERNAL VIEWING MIRROR

Xiao Shudong (Third People's Hospital, Shanghai Medical College Number 2)

9 Cases of patients with digestive ulcer or gastric rot accompanied by a large amount of bleeding are treated under emergency internal viewing mirror inspection with bleeding stopped by the Argon laser (output end of the optical fibre is 4.8-6.2 Watts, time 15-45 seconds). Results are satisfactory.

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INTERNAL VIEWING MIRROR WITH ARGON ION LASER LIGHT CONGEALING SYSTEM

Zhu Qing Zhu Yaozhen Zhang Huiguo Ma Jizhuang Xiao Shudong
Hu Yubiao Zhang Dezhong (Third People's Hospital, Shanghai Medical College Number 2)

The experimental data and structure of the internal viewing mirror with Argon ion laser light congealing treatment system are reported. The unit is used in clinical applications with output end power of the optical fibre 4.8-6.2 Watts and optically conductivity 90%

TREATMENT OF DIGESTIVE TRACT BLEEDING BY INTERNAL VIEWING MIRROR WITH LASER (I)

Lu Hanming Xu Youru Wang Xiuling Yao Xiaoheng (Digestive Disease Research Laboratory Number 3, Shanghai Medical College Number 2)

Zhang Wenke Wang Yikang Chu Yude Qiao Fang Xu Xuelin Dong Shimin
Wei Tingfa (New China Hospital, Shanghai Medical College Number 2)

We report on the results of experimental dog stomach con-
gealing and have stopped bleeding with completely domestic equipment
since 1977.

TREATMENT OF DIGESTIVE TRACT BLEEDING WITH INTERNAL VIEWING MIRROR
WITH LASER (II)

Lu Hanmin Xu Youru Wang Xiulin Yao Xiaoheng Jiang Jinghao
(Digestive Disease Research Laboratory Number 3, Shanghai Medical
College Number 2)

Zhang Wenke Chu Yude Ziao Fang Wei Tingxuan Wang Yikang Xu Xuelin
(New China Hospital, Shanghai Medical College Number 2)

Based on the first hand information on the reliability and
safety of treating digestive tract bleeding with an internal viewing
mirror with Argon laser, using entirely domestic equipment in the
completed experimental study, together with reference to foreign pub-
lished report on clinical experience, we treated the first 14 cases
of emergency digestive tract bleeding and obtained good results.

DISCUSSIONS ON 75 CASES OF TREATING ULCEROUS INTESTINAL INFECTION
WITH He-Ne LASER LIGHT IRRADIATION THROUGH OPTICAL GUIDE BUNDLES.

Xu Yikang Gong Weizhen Zeng Xianmin Xu Meijie (Shanghai Hangpu
Central Hospital)

We report on a total of 120 cases of treating ulcerous intestinal
infection by using optical guidance bundles to channel He-Ne laser
light into the intestinal cavity. Discussions and analysis are presented
for 75 cases with completed treatment and records.

FURTHER OBSERVATION OF TREATING MOUTH AND FACIAL HEMANGIOMA BY LASER
Ma Baozhang Zhou Hui (the 9th Hospital, Shanghai Medical College
Number 2)

Xu Songlin Xhuo Reipeng (Biophysics Educational Research Laboratory

Shanghai Medical College Number 2)

Analysis on the results of treating 304 cases of Hemangioma patients with Nd:YAG laser. It is determined that treating mouth and facial hemangioma with Nd:YAG laser is an effective method. After treatment, not only the disease base is eliminated, but the original anatomical shape is maintained. The effect is satisfactory. Discussions on the experience or irradiation are also presented.

PRELIMINARY USE OF CO₂ LASER KNIFE IN MOUTH AND FACIAL SURGERY (I)

Ma Baozhang Qiu Weiliu Ha Zi Xu Xiuqi Zhou Hui (The 9th Hospital Shanghai Medical College Number 2)

Zhuo Reipeng (Biophysics Educational Research Laboratory, Shanghai Medical College Number 2)

Animal and clinical use of a CO₂ laser knife in cutting soft tissues is reported. Discussions on the technical training of the user and safety are also presented.

PRELIMINARY USE OF CO₂ LASER KNIFE IN MOUTH AND FACIAL SURGERY (II)

Ma Baozhang Xu Xiuqi Zhou Hui Liu Zhen (The 9th Hospital, Shanghai Medical College Number 2)

We report on the result of using the CO₂ laser knife to cut the upper and lower jaw bones. The results are: the laser speckle power density should not be lower than Watt/cm; the cutting speed for a canine lower jawbone of thickness 1.0-1.5 cm and height 1.5-2.0 cm should require about 24 -38 seconds, with cutting edge damage about 2-3 mm. There are 12 clinical cases. Suggestions are also given for things one should pay attention to when making cuts and for improvements on the optical knife apparatus.

APPLICATION OF CO₂ LASER TO MAKING HOLES IN THE BONE IN NOSE TEAR DUCT

Nie Chuanxian Wang Hanquan Tan Songnian Shi Xianghe (Ophthalmology Department, Ruijin Hospital, Shanghai Medical College Number 2)

Based on our numerous occasions of CO₂laser experimentation on animals, our clinical experience makes us realize the many advantages of making holes in bones with the CO₂laser. This also initiates our application of the CO₂laser in Ophthalmology

PRELIMINARY EXPERIMENTAL RESULTS ON HOLOGRAPHY OF THE LOWER EYE

Yao Wenhua Chen Shanhua Jia Yurun (Fudan University) Wang Kangsun
(Ruijin Hospital, Shanghai Medical College Number 2)

We reported on the design considerations of a holographic optical system for photographing the lower eye, as well as the holographic display of an eye model and of a rabbit eye.

TREATMENT OF SIMPLE HEMANGIOMAS WITH ARGON ION LASER

Zhu Qing Mao Weihan Zhu Uaozhen Zhang Huiguo Ma Jizhuang (Dermatology Department, Third People's Hospital, Shanghai Medical College Number 2)

We report on the clinical experience of treating hemangiomas with a continuous Argon ion laser. The tissue change after Argon laser irradiation has been observed with the crown of Leghorn cocks as a model. The instrument's output power after going through the optical guides is 1.2-3 Watts.

OBSERVATIONS ON THE EFFECT OF CO₂ LASER UPON THE SPERMS OF DOMESTIC RABBITS AND RATS

Embryology Educational Research Group, Shanghai Medical College Number 2.
Laser Laboratory, Jinshan County People's Hospital, Shanghai

We report on the testicle irradiation experiment involving 19 rats (with 8 as control) and 18 domestic rabbits (with 9 as control) with the expanded beam of a CO₂laser with output of 22 Watts. The results indicate that the sequence in which the sperms were disturbed is the same as that in which cells change after being heated, thus suggesting that the disturbance produced in the sperms by the CO₂laser is probably due to thermal effect.

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